The Hong Kong University of Science and Technology

Department of Information Systems, Business Statistics and Operations Management
Department of Industrial Engineering and Decision Analytics

Joint Seminar Announcement

Allocating Emission Permits Efficiently via Uniform Linear Mechanisms

by

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Date : **Friday, 17 March 2023**
Time : **10:30 am - 11:45 am**
Venue : **Room G003, LSK Business Building**

Abstract:

We study the problem of allocating emission permits in an emissions trading system and provide efficiency guarantee of simple uniform linear allocation mechanisms in the broad class of component-wise concave mechanisms. It was well accepted in the literature that the equilibrium consumer surplus and social welfare are not affected by the initial allocation of emission permits in a deterministic system without trading fractions. However, the initial allocations previously considered were largely restricted to constant ones that do not depend on the firms' current production decisions. We show that, by allowing more general mechanisms that are component-wise concave in the firm's production decision, which capture many realistic allocation rules including lump-sum allocations (such as grandfathering), output-based allocations (either top-down or bottom-up), etc., consumer surplus will no longer be independent of the initial allocations. In particular, for N firms operating under Cournot competition that differs in their abatement abilities, uniform linear permit allocation mechanisms are the most efficient, i.e., achieve the maximum equilibrium aggregate production output given the same level of equilibrium emission, hence the maximum consumer surplus. By defining a monopoly's problem that is equivalent to the original N -firm system, the regulator can thus reduce the search space of N -dimensional allocation mechanisms to a single coefficient. Numerical experiments show that the benefit of uniform linear mechanisms compared to constant ones can be large.

Bio:

Jiaqi Lu is an Assistant Professor with a joint appointment at the School of Data Science and the School of Management and Economics, the Chinese University of Hong Kong, Shenzhen. She majored in both Industrial Engineering and English during undergraduate at Tsinghua University in 2013. In 2015, she completed her master study of management science and engineering at Columbia University. She obtained her doctoral degree in Decision, Risk, and Operation from Columbia University in 2021. Her research uses applied probability, optimization, statistical physics and machine learning tools to address complex operational problems in businesses and society. Specific directions include the analysis and design of large matching markets, supply chain management, and customer relationship management.